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Published in:
Occupational Medicine-Oxford

DOI:
[10.1093/occmed/kqm134](https://doi.org/10.1093/occmed/kqm134)

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Document Version
Publisher's PDF, also known as Version of record

Publication date:
2008

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Roelen, C. A. M., Schreuder, K. J., Koopmans, P. C., & Groothoff, J. W. (2008). Perceived job demands relate to self-reported health complaints. *Occupational Medicine-Oxford*, 58(1), 58-63.
<https://doi.org/10.1093/occmed/kqm134>

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Perceived job demands relate to self-reported health complaints

Corne A. M. Roelen^{1,2}, K. Jeep Schreuder¹, Petra C. Koopmans^{2,3} and Johan W. Groothoff²

Background	Illness and illness behaviour are important problems in the Dutch workforce. Illness has been associated with job demands, with high demands relating to poorer health. It has not been reported whether subjective health complaints relate to job demands.
Aims	To investigate whether perceived (physical and mental) workload and specific job demands are associated with self-reported health complaints.
Methods	Cross-sectional study of a random sample of 983 male employees working in manufacturing industry. Job demands and health complaints were investigated using the self-completed Basic Occupational Health Questionnaire. The relationship between demands and health complaints were studied using logistic regression analysis with health complaints as the outcome variable.
Results	The questionnaires of 867 workers (88%) were suitable for analysis. The prevalence of health complaints was high. Physical workload was related to musculoskeletal symptoms. Standing work predicted pain in the legs and thoracic as well as low back pain, while sedentary work predicted low back pain. Heavy lifting predicted low back pain and pain in the extremities. Regular bending predicted low back pain and pain in the legs. Repetitive movements predicted pain in the arms and thoracic as well as low back pain. Mental workload was associated with fatigue and chest pain. Working under time pressure and working behind schedule were not related to self-reported health complaints.
Conclusions	Perceived physical job demands matched with self-reported musculoskeletal complaints, whereas perceived mental job demands were unrelated to specific complaints.
Key words	Health complaints; illness behaviour; mental job demands; physical job demands.

Introduction

Increasing intensity or duration of workload results in an increased risk of illness or disease [1,2]. Broersen *et al.* [3] reported that differences in health complaints between occupational groups reflected differences in work demands and exposure. Workload is divided into physical and psychological characteristics. In a cross-sectional study among 44 486 active Dutch workers, the prevalence of musculoskeletal complaints was significantly higher among employees working in physically demanding jobs [4]. Andersen *et al.* [5] investigated specific job

characteristics in the general working population and reported that highly repetitive work predicted pain in the arms. Heavy lifting and prolonged standing predicted low back pain and heavy pushing or pulling predicted pain in the lower limb.

Psychological demands also have a profound impact on health [6–9]. The relationship between work conditions and the level of psychological distress in employees has been explored in a number of studies [10], showing consistent associations with long working hours, high job demands, low job control, low social support at work and job insecurity. There are indications that perceived workload is more important in determining health than the actual workload [11].

Most research on the associations between job demands and health has investigated disease or injury. For occupational health practice, it would also be interesting to know whether job demands are associated with self-rated health. It can be hypothesized that workers who experience high workloads are more likely to complain

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about their health. Non-specific symptoms such as pain, distress and fatigue have a high prevalence in the working population. In a two-year prospective study of a general working population, only 8% of 4006 respondents were free of musculoskeletal pain [5]. Bourbonnais *et al.* [7] found a 28% prevalence of psychological distress among 2889 white-collar workers. Fatigue was reported by 22% of the workers in the Dutch Maastricht Cohort Study [12]. Persistent symptoms result in illness, defined as a feeling of not being healthy.

Although illness does not necessarily mean disease (i.e. an objectively measurable condition of the body), it will lead to illness behaviour. Abnormal illness behaviour includes syndromes of excessive or inadequate response to symptoms, such as somatization, hypochondria or denial of illness [13]. Increased attention to bodily sensations, sensitivity to pain and catastrophizing are associated with abnormal illness behaviour. Illness and illness behaviour are important problems in the Dutch workforce, leading to loss of productivity and sickness absence [14]. High job demands are associated with poorer health. Little is known, however, on the relationship between perceived demands and the type of self-reported health complaints. Therefore, this study investigated perceived demands and self-reported health complaints. The aim was to discover whether experienced job characteristics were related to subjective health complaints.

Methods

Ihlebaek and Eriksen concluded that the differences in health between the occupational groups they studied were mainly explained by gender [15]. To exclude gender effects, we studied a sample of 983 male workers randomly drawn from a population of 2894 male employees working in companies in the Dutch province Friesland associated with the ArboNed Leeuwarden Occupational Health Department. This department provides occupational health services to production industries with a personnel range of 100–500 workers per company. Most employees are machine operators and maintenance technicians [16] supporting an automated production process. A minority belong to the administrative and managerial staff of the companies.

Ethical approval was sought from the Medical Ethics Committee of the University Medical Center Groningen, who advised that ethical clearance was not required because the study reports results on group level.

The workers included in the sample were invited for a preventive medical consultation in the years 2004–2006. The aims and methods of the study were explained to all workers after which they signed an informed consent form. The investigators were independent of the ArboNed Leeuwarden Department and were not perceived as being part of the occupational health (management) structure of the companies. Prior to the consultation, the workers

completed the Basic Occupational Health Questionnaire anonymously. This valid and reliable self-completed questionnaire consists of 116 dichotomous questions about health complaints, work conditions, organizational climate and workplace relationships [17].

The work demands were determined according to the worker's perception in the last month. We used the question 'Is your work physically very demanding?' as a measure for perceived physical workload; the question could be answered with no or yes. Mental workload was investigated accordingly, using the question 'Is your work mentally very demanding?' The Basic Occupational Health Questionnaire inquired about six specific physical job demands (prolonged standing, prolonged sitting, heavy lifting, regular bending, regular high reaching and repetitive movements) and five specific psychological demands (prolonged attention, time pressure, work piling up, work difficulty and overtime working). These specific work demands were also determined according to the worker's experience and were related to the self-reported health complaints in the last month.

The data were analysed using SPSS for Windows, version 14. Logistic regression analyses were applied to investigate the relationship between perceived workload and self-reported health complaints, with workload as the outcome variable.

Multiple logistic regression analyses were performed to study the associations of specific job demands with subjective health complaints in more detail. These regression analyses were performed with the specific health complaint as outcome variable, controlling for all other complaints. Because of the multiple analyses, a Bonferroni correction was necessary, after which we accepted a *P* value of 0.01 as statistically significant.

Results

The study population consisted of 983 male workers. One hundred and seven individuals (mean age 38.1 ± 10.2 years; age range 32–61 years) did not participate, and of the 876 questionnaires assessed, a further nine had to be excluded because they were not adequately completed. The questionnaires of 867 participants (mean age of 35.8 ± 10.4 years; age range 23–61 years) were suitable for analysis; 111 workers (13%) perceived high physical workload, 168 workers (19%) mentioned high mental workload and 651 workers (75%) reported to have had one or more complaints in the month preceding the consultation. Musculoskeletal symptoms were the most commonly reported health complaints. Fatigue (25%) and rhinitis/sneezing (23%) were also mentioned frequently as is shown in Table 1.

The results of logistic regression analysis (Table 1) showed higher odds of low back pain and pain in the arms and in the legs among employees reporting high physical workload. Their odds of neck pain were lower. Workers

Table 1. The relation between health complaints and workload

Complaint	Prevalence (%)	Physical workload, odds ratio (99% confidence interval)	Mental workload, odds ratio (99% confidence interval)
Feeling tired	25	1.4 (0.6–3.2)	1.9 (1.0–3.7)*
Feeling sleepy/drowsy	15	1.4 (0.6–3.1)	0.8 (0.4–1.7)
Sleeping problems	10	1.2 (0.5–3.0)	1.4 (0.7–3.1)
Feeling nervous/agitated	8	1.9 (0.6–6.3)	2.3 (0.9–5.9)
Coping problems	7	1.4 (0.5–3.9)	1.4 (0.6–3.3)
Regular headaches	11	0.8 (0.3–1.9)	0.8 (0.4–1.8)
Concentration problems	12	0.6 (0.2–1.7)	1.1 (0.5–2.6)
Memory problems	13	1.5 (0.6–3.5)	1.0 (0.5–2.2)
Stomach ache	7	1.0 (0.4–2.8)	0.5 (0.2–1.4)
Chest pain	8	1.7 (0.6–4.8)	2.4 (1.1–5.5)*
Vision problems	14	1.0 (0.4–2.2)	1.0 (0.5–2.1)
Irritated/itchy eyes	19	0.7 (0.3–1.7)	1.0 (0.5–1.9)
Hearing problems	12	1.3 (0.6–2.8)	0.6 (0.3–1.3)
Hoarse voice	3	1.9 (0.4–9.0)	1.3 (0.4–4.7)
Rhinitis/sneezing	23	1.9 (0.9–3.7)	1.3 (0.7–2.4)
Bronchitis/coughing	11	1.2 (0.5–3.0)	2.0 (0.9–4.1)
Getting out of breath easily	18	0.6 (0.2–1.3)	1.0 (0.5–2.0)
Pain in the arms	26	2.5 (1.2–5.0)*	0.8 (0.5–1.6)
Pain in the legs	16	2.6 (1.3–5.2)*	1.2 (0.6–2.3)
Neck pain	23	0.4 (0.2–0.8)*	1.0 (0.5–2.0)
Thoracic back pain	9	1.8 (0.7–4.4)	0.9 (0.5–1.6)
Low back pain	29	2.1 (1.1–4.0)*	0.9 (0.4–2.0)

The prevalence of health complaints in the total study population ($n = 867$) and their odds ratios (99% confidence intervals) in workers reporting either high physical or high mental workload; * $P < 0.01$.

experiencing high mental workload had higher odds of feeling tired and reported chest pain more often.

Prolonged standing was related to pain in the legs and thoracic as well as low back pain (Table 2). Employees who mentioned standing work had higher odds of feeling nervous/agitated. Prolonged sitting was associated with irritated/itchy eyes and low back pain. Sedentary workers had lower odds of coping problems. Heavy lifting was related to pain in the arms and legs as well as low back pain. Bending was associated with pain in the legs and low back pain. Repetitive arm movements were related to pain in the arms and both thoracic and low back pain. Regular high reaching was mentioned infrequently (number yes/no = 29/837) and was therefore excluded from the analysis.

Working under time pressure was negatively related to hearing problems, but did not predict health complaints. The odds ratio for feeling nervous/agitated was 2.3 (99% CI 0.9–5.9) for working under time pressure and 2.5 (99% CI 1.0–6.7) when work was piling up, but neither was significant at the $P < 0.01$ level. Prolonged attention was mentioned by most employees (number yes/no = 408/459) and we excluded this job demand from our analysis considering it to be non-specific. Both work difficulty (number yes/no = 10/857) and overtime work (number yes/no = 30/837) were mentioned infrequently and were therefore excluded.

Discussion

Our study found that workers who experienced high physical workload were at higher risk of musculoskeletal pain. Workers reporting high mental workload were at higher risk of fatigue and chest pain. The study added new knowledge about specific job characteristics, particularly prolonged standing, sedentary work, heavy lifting, regular bending and repetitive arm movements matching the subjective health complaints. However, it was virtually impossible to study isolated job demands. Combined heavy lifting and bending occurred in 60% of cases. Working under time pressure and working behind schedule were mentioned in combination in ~40% of cases. When job demands occur in combination, overlapping complaints are to be expected.

The study had some other limitations. Questionnaire results may be distorted by response styles, social desirability, attribution processes or personal characteristics particularly negative affectivity which implies that some people are inclined to complain about everything. Using the health complaint as outcome variable and controlling for all other complaints cancelled out the effect of negative affectivity. Nevertheless, it is important to keep in mind that questionnaire responses may be influenced by how someone feels. For example, it has been reported that musculoskeletal pain biased the self-assessment of workload [18].

Table 2. The relation between health complaints and specific work demands

	Are you troubled during work with ...						
	Prolonged standing	Prolonged sitting	Heavy lifting	Regular bending	Repetitive movements	Time pressure	Work piling up
	(Number yes/no)						
	(<i>n</i> = 126/750)	(<i>n</i> = 111/755)	(<i>n</i> = 135/731)	(<i>n</i> = 153/713)	(<i>n</i> = 130/736)	(<i>n</i> = 408/459)	(<i>n</i> = 180/687)
Feeling tired	0.9 (0.4–2.1)	1.2 (0.5–2.6)	1.1 (0.5–2.3)	1.0 (0.5–2.1)	1.1 (0.5–2.4)	1.4 (0.8–2.3)	1.3 (0.7–2.6)
Feeling sleepy/drowsy	1.1 (0.5–2.5)	1.4 (0.6–3.3)	1.1 (0.5–2.5)	1.2 (0.6–2.5)	1.1 (0.5–2.5)	0.8 (0.4–1.4)	0.6 (0.3–1.3)
Sleeping problems	1.4 (0.6–3.4)	0.7 (0.2–1.8)	1.0 (0.4–2.4)	2.0 (0.9–4.5)	1.2 (0.5–2.8)	0.7 (0.4–1.5)	0.9 (0.4–2.2)
Feeling nervous/agitated	4.3 (1.4–3.8)*	1.8 (0.6–5.5)	1.5 (0.5–4.9)	0.9 (0.3–3.0)	2.3 (0.8–7.0)	2.3 (0.9–5.9)	2.5 (1.0–6.7)
Coping problems	0.7 (0.2–2.3)	0.2 (0.0–0.8)*	1.5 (0.5–4.0)	0.8 (0.3–2.3)	1.1 (0.4–3.2)	0.9 (0.4–2.1)	1.3 (0.5–3.3)
Regular headaches	0.7 (0.3–1.8)	0.8 (0.3–2.0)	0.8 (0.3–1.9)	0.9 (0.4–2.1)	1.0 (0.4–2.2)	1.0 (0.5–2.0)	0.7 (0.3–1.6)
Concentration problems	0.7 (0.2–1.9)	1.4 (0.5–3.5)	1.0 (0.4–2.6)	0.9 (0.4–2.4)	1.5 (0.6–3.6)	1.2 (0.6–2.4)	1.2 (0.5–2.8)
Memory problems	1.1 (0.5–2.6)	1.8 (0.8–4.0)	1.2 (0.6–2.7)	1.2 (0.5–2.7)	0.8 (0.4–1.8)	1.0 (0.5–1.8)	0.9 (0.4–2.0)
Stomach ache	0.7 (0.2–2.1)	1.0 (0.3–3.0)	0.8 (0.3–2.1)	0.8 (0.3–2.2)	0.6 (0.2–1.7)	1.2 (0.5–2.5)	0.8 (0.3–2.0)
Chest pain	0.6 (0.2–2.0)	1.5 (0.5–4.2)	1.1 (0.4–3.0)	1.1 (0.4–2.9)	0.8 (0.3–2.2)	1.8 (0.8–3.8)	0.9 (0.3–2.1)
Vision problems	0.7 (0.3–1.7)	1.1 (0.5–2.4)	1.9 (1.0–3.9)	0.9 (0.5–2.0)	1.5 (0.7–3.2)	0.8 (0.5–1.5)	0.7 (0.4–1.5)
Irritated/itchy eyes	0.8 (0.4–1.7)	2.5 (1.2–5.0)*	0.6 (0.3–1.3)	1.1 (0.6–2.2)	0.9 (0.5–1.9)	1.5 (0.8–2.5)	1.8 (1.0–3.4)
Hearing problems	1.7 (0.8–3.7)	0.6 (0.2–1.4)	1.2 (0.6–2.5)	1.0 (0.5–2.0)	1.2 (0.6–2.6)	0.5 (0.3–1.0)*	0.4 (0.2–1.0)
Hoarse voice	0.9 (0.1–5.0)	2.5 (0.7–9.8)	1.6 (0.4–6.3)	1.5 (0.4–5.7)	0.9 (0.2–4.1)	1.4 (0.4–4.5)	1.3 (0.4–4.4)
Rhinitis/sneezing	1.3 (0.6–2.5)	1.1 (0.6–2.3)	1.3 (0.7–2.4)	1.3 (0.7–2.3)	1.7 (0.9–3.2)	1.1 (0.7–1.8)	1.6 (0.9–2.8)
Bronchitis/coughing	1.7 (0.7–4.2)	0.6 (0.2–1.6)	1.8 (0.8–4.0)	1.0 (0.4–2.3)	1.0 (0.4–2.3)	1.8 (0.9–3.6)	1.9 (0.9–4.0)
Getting out of breath	1.0 (0.5–2.2)	1.1 (0.5–2.4)	0.8 (0.4–1.8)	1.1 (0.5–2.2)	1.0 (0.5–2.0)	0.7 (0.4–1.3)	0.8 (0.4–1.6)
Pain in the arms	1.1 (0.6–2.3)	0.8 (0.4–1.6)	2.4 (1.3–4.6)*	1.5 (0.8–2.8)	2.2 (1.2–4.1)*	1.1 (0.7–1.8)	1.1 (0.6–2.0)
Pain in the legs	3.0 (1.5–5.8)*	1.5 (0.7–3.1)	2.0 (1.0–3.8)*	2.4 (1.3–4.4)*	1.2 (0.6–2.4)	1.1 (0.7–2.0)	0.6 (0.3–1.3)
Neck pain	0.6 (0.3–1.4)	1.6 (0.8–3.3)	0.5 (0.3–1.1)	0.5 (0.2–1.1)	1.2 (0.6–2.3)	0.8 (0.5–1.4)	1.3 (0.7–2.4)
Thoracic back pain	3.0 (1.3–6.9)*	1.3 (0.7–3.2)	2.0 (0.9–4.4)	2.2 (1.0–4.9)	2.4 (1.1–5.3)*	1.9 (0.9–3.9)	1.4 (0.6–3.1)
Low back pain	2.4 (1.3–4.4)*	1.9 (1.0–3.5)*	3.2 (1.8–5.7)*	3.0 (1.7–5.1)*	2.0 (1.1–3.6)*	1.1 (0.7–1.7)	1.0 (0.6–1.8)

Odds ratios (99% confidence intervals) of specific health complaints in standing work, sedentary work and employees reporting heavy lifting, regular bending, repetitive arm movements, working under time pressure and work piling up; **P* < 0.01.

The random selection of workers and their high participation rate (89%) will have limited selection bias. The recognized validity of the Basic Occupational Questionnaire and the relatively short recall period it asked for (1 month) will have restricted information bias. However, the results suffer from the fact that we could not control for possible confounding by age, lifestyle or demographics. Health questions show an increase in complaints with increasing age [3]. The age of participating and non-participating workers could be retrieved from their occupational health files. The Basic Occupational Health Questionnaire, however, does not register age. Therefore, the results of the anonymous questionnaires could not be associated with this variable. In addition, the questionnaire did not include information on socio-economic status. Earlier research showed socio-economic status to be related to health: persons from lower socio-economic classes have higher odds of feeling unhealthy [19]. Not being able to control for these confounders precluded conclusions on causality.

In general, the prevalence of health complaints in our study population was high: 75% of the employees reported to have had health complaints in the last month,

particularly musculoskeletal pain. Workers reporting prolonged standing were at increased risk of (thoracic and low) back pain and pain in the legs. The physical workload in the back and legs due to standing work was investigated in an industrial population by Van Dieën and Oude Vrielink [20]. They concluded that standing shifts of 60 min should be avoided and frequent short breaks were to be preferred. We could not explain why workers who mentioned prolonged standing were at higher risk for nervousness and agitation. Possibly, the standing workers are the lower socio-economic class employees who have fewer strategies to cope with stress, but this is speculative.

Workers reporting prolonged sitting were at increased risk of low back pain. Sedentary workers frequently adopt non-neutral postures of the trunk, and working in a forced non-neutral trunk posture is a risk factor for musculoskeletal pain [21]. In the modern occupational setting, sedentary work is mainly computer work. Work time with the computer was found to be a prognostic factor for musculoskeletal symptoms in the neck/shoulder, elbow/hand and the low back [22,23]. The higher odds of irritated/itchy eyes among sedentary workers

could be explained by the fact that they were mainly office workers. Eye irritation is a recognized complaint in the office environment [24,25]. Obviously, the higher socio-economic class office workers were at lower risk of coping problems.

Workers reporting regular bending or heavy lifting were at higher risk of (low) back pain, which is in agreement with earlier studies. Hoogendoorn *et al.* [26] concluded that flexion and lifting at work were risk factors for sickness absence due to low back pain. Our results showed that trunk flexion and heavy lifting also predicted pain in the legs, which is in line with the results of Andersen *et al.* [5]. The finding that heavy lifting was related to pain in the arms has not been reported before. Pain in the arms was also associated with repetitive arm movements, which was in agreement with the results of previous studies [5,27]

Mental workload predicted fatigue and chest pain. Many studies have reported an association between psychological job strain and cardiovascular disease. However, the greater number of our workers reporting chest pain will not suffer cardiovascular pathology. In fact, this applies to all self-reported health complaints in this study: they do not necessarily indicate disease or injury. However, persistent health complaints result in a feeling of being unhealthy, provoking illness behaviour and loss of work productivity or sickness absence. The match we found between demands and health complaints suggests that job demands play a role, particularly in the high prevalence of musculoskeletal symptoms. If future research confirms causal relations between perceived work demands and subjective health complaints, then lowering perceived workload could reduce the prevalence of complaints in the workforce and prevent illness behaviour. In that case, not only the objectively assessed work demands are an important issue in occupational health but also the subjectively experienced workload. Furthermore, it would be interesting to investigate which subjective health complaints are associated with abnormal illness behaviour.

Key points

- The prevalence of health complaints is high in the workforce, with 78% of working employees complaining particularly of musculoskeletal pain, rhinitis/sneezing and fatigue.
- Perceived physical job demands matched self-reported health complaints, whereas perceived mental demands did not.
- If perceived work demands are causally related to self-reported health complaints, then the subjectively experienced workload becomes an important issue in occupational health besides objectively assessed work demands.

Conflicts of interest

None declared

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